

Claims

What is claimed is:

1. A recombinant host cell comprising one or more expression vectors that drive expression of enzymes capable of making a product and a precursor required for biosynthesis of the product in said host cell, wherein said host cell, in the absence of said expression vectors, is unable to make said product due to lacking all or a part of a biosynthetic pathway required to produce the precursor.

2. A recombinant host cell comprising one or more expression vectors that drive expression of enzymes capable of making a product and a precursor required for biosynthesis of the product in said host cell, wherein said host cell, in the absence of said expression vectors for said enzymes capable of making said precursor, makes said product in substantially lesser amounts due to said precursor being present in said host in limiting amounts.

3. The host cell of Claim 1 or 2, wherein said precursor is a primary metabolite that is produced in a first cell but not in a second heterologous cell.

4. The host cell of any of Claims 1 or 2, wherein said product is a polyketide.

5. The host cell of Claim 4, wherein said polyketide is a polyketide synthesized by either a modular, iterative, or fungal PKS.

6. The host cell of Claim 5, wherein said precursor is selected from the group consisting of malonyl CoA, propionyl CoA, methylmalonyl CoA, ethylmalonyl CoA, and hydroxymalonyl CoA.

7. The host cell of Claim 6, wherein said precursor is methylmalonyl
CoA.

8. The host cell of Claim 7 that is either a procaryotic or eukaryotic
5 host cell.

9. The host cell of Claim 8 that is an *E. coli* host cell.

10. The host cell of Claim 8 that is a yeast host cell.
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11. The host cell of Claim 8 that is a plant host cell.

12. The host cell of Claim 9, wherein said polyketide is synthesized by
a modular PKS.
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13. The host cell of Claim 12, wherein said precursor biosynthetic
enzyme is a methylmalonyl CoA mutase that converts succinyl CoA to
methylmalonyl CoA.

14. The host cell of Claim 13, wherein said methylmalonyl CoA mutase
is derived from propionibacteria.
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15. The host cell of Claim 14, which has been further modified to
overexpress a B12 transporter gene.
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16. The host cell of Claim 15, wherein said B12 transporter gene is
endogenous to *E. coli*.

17. The host cell of Claim 14 in media that facilitates B12 uptake.

18. The host cell of Claim 13 that further comprises an epimerase that converts R-methylmalonyl CoA to S-methylmalonyl CoA.

5 19. The host cell of Claim 18, wherein said epimerase is derived from propionibacteria.

20. The host cell of Claim 18, wherein said epimerase is derived from *Streptomyces*.

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21. The host cell of Claim 12, wherein said precursor biosynthetic enzyme is a propionyl CoA carboxylase that converts propionyl CoA to methylmalonyl CoA.

15 22. The host cell of Claim 21 that has been further modified to overexpress a biotin transferase enzyme.

23. The host cell of Claim 22, wherein said biotin transferase enzyme is encoded by the *birA* gene.

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24. An *E. coli* host cell that expresses heterologous methylmalonyl CoA mutase and epimerase genes.

25 25. A yeast host cell that expresses heterologous methylmalonyl CoA mutase and epimerase genes.